CLAIMS

WE CLAIM:

1. A molecular manipulator, comprising:

a light-sensitive molecule, including a double bond, that changes a *cis-trans* configuration of the double bond in response to illumination by light of a selected wavelength; and

a probe to which the light-sensitive molecule is attached.

2. The molecular manipulator of claim 1, wherein the probe comprises one of a tip and a line of a scanned-proximity probe microscope.

3. The molecular manipulator of claim 1, wherein the probe comprises one of silicon, silicon oxide, aluminum oxide, and titanium oxide.

4. The molecular manipulator of claim 1, wherein the light-sensitive molecule comprises an azo compound.

5. The molecular manipulator of claim 1, wherein the light-sensitive molecule further includes:

two arms, at least one of the two arms including the double bond; and

a moiety located between the two arms.

6. The molecular manipulator of claim 5, wherein a first arm of the two arms includes a single azo double bond, and a second arm of the two arms includes other than an azo double bond.

7. The molecular manipulator of claim 1, wherein the light-sensitive molecule comprises a monoazo compound.

8. The molecular manipulator of claim 5, wherein each of the two arms includes an azo double bond.

9. The molecular manipulator of claim 1, wherein the light-sensitive molecule comprises a diazo compound.

10. The molecular manipulator of claim 8, wherein each of the two arms includes an azo double bond comprising a same *cis-trans* configuration, when illuminated by the light of the selected wavelength.

11. The molecular manipulator of claim 5, wherein each of the two arms includes a first end, which is bonded to the moiety, and a second end, which includes a functional group, R.

12. The molecular manipulator of claim 11, wherein the functional group, R, comprises one of an alkyl, a haloalkyl, an aryl, an alcohol, an ether, an amine, an aldehyde, a ketone, a carboxylic acid, an ester, and an amide.

13. The molecular manipulator of claim 5, wherein the moiety includes a functional group, which covalently bonds to the probe.

14. The molecular manipulator of claim 13, wherein the functional group comprises one of a sulfide, a thiol, and an isonitrile.

15. The molecular manipulator of claim 13, wherein the probe is coated by a coating, to which the functional group of the moiety covalently bonds.

16. The molecular manipulator of claim 15, wherein the coating comprises a metal coating including one of gold, palladium, and platinum.

17. The molecular manipulator of claim 15, wherein the coating comprises one of trichlorosilane and trialkoxylsilane, and the probe comprises a conductive metal oxide.

18. The molecular manipulator of claim 5, wherein each of the two arms comprises a different length.

19. The molecular manipulator of claim 11, wherein a space is formed between the two arms that is varied by selecting a functional group, R, for each of the two arms.

20. A method of making a molecular manipulator, comprising:

covalently bonding to a probe, a light-sensitive molecule, including a double bond, that changes a *cis-trans* configuration of the double bond in response to illumination by light of a selected wavelength.

21. The method of making a molecular manipulator of claim 20, further comprising:

coating the probe with a metal coating to which the light-sensitive molecule covalently bonds.

22. The method of making a molecular manipulator of claim 20, further comprising:

coating the probe with one of trichlorosilane and trialkoxylsilane, wherein the probe comprises a conductive metal oxide.

23. The method of making the molecular manipulator of claim 20, wherein the covalently bonding to a probe occurs at a moiety located between two arms of the light-sensitive molecule.

24. The method of making the molecular manipulator of claim 23, wherein a space located between the two arms of the light-sensitive molecule is varied by selecting a functional group, R, for each of the two arms.

25. A method of moving a nanostructure, comprising:

grasping the nanostructure with a light-sensitive molecule, which is attached to a probe, by illuminating the light-sensitive molecule with light of a first wavelength;

moving the nanostructure, which is grasped, to a predetermined position by moving the probe to the predetermined position; and

releasing the nanostructure from the light-sensitive molecule by illuminating the light-sensitive molecule with light of a second wavelength.

26. The method of moving a nanostructure of claim 25, wherein the grasping the nanostructure comprises changing a double bond from a *trans* configuration to a *cis* configuration within the light-sensitive molecule.

27. The method of moving a nanostructure of claim 26, wherein changing a double bond from a *trans* configuration to a *cis* configuration comprises changing an azo double bond from a *trans* configuration to a *cis* configuration

28. The method of moving a nanostructure of claim 25, wherein the releasing the nanostructure comprises changing a double bond from a *cis* configuration to a *trans* configuration within the light-sensitive molecule.

29. The method of moving a nanostructure of claim 28, wherein changing a double bond from a *cis* configuration to a *trans* configuration comprises changing an azo double bond from a *cis* configuration to a *trans* configuration

30. The method of moving a nanostructure of claim 25, further comprising:

moving the probe into a proximate position with the nanostructure by using an atomic force mode of operation of a scanned-proximity probe microscope.